DEPARTMENT OF PLANNING, INDUSTRY & ENVIRONMENT

Manageable high threat weeds – improving gain on offset sites

Biodiversity Assessment Method Practice Note

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1. Background

1.1 Biodiversity Offsets Scheme

The NSW Biodiversity Offsets Scheme (BOS) was established under the *Biodiversity Conservation Act 2016*. It provides a framework for offsetting unavoidable impacts on biodiversity from development. Offset sites are established under biodiversity stewardship agreements (BSAs), where landholders improve and manage biodiversity values into perpetuity. The NSW Department of Planning, Industry and Environment established the Biodiversity Assessment Method (BAM) (DPIE 2020) to assess impacts on biodiversity from development and clearing, or improvements to biodiversity on a BSA site. It provides a transparent, consistent and scientifically based approach to biodiversity assessment.

1.2 Manageable high threat weeds

The BAM gain model is used to calculate the averted loss of, and predicted improvements (gain) to, biodiversity values on BSA sites. Under the gain model, high threat weeds (HTW) reduce gain achieved from management actions. They are considered difficult to manage effectively and pose a risk to achieving predicted gain. As evidence supports the successful removal and control of some HTW species however, this setting was adjusted in the BAM 2020.

HTW considered to be 'manageable' (manageable-HTW) are a subset of the High Threat Weeds list. They are species where sufficient evidence demonstrates their abundance and impact can be effectively reduced with well-planned and implemented management actions. These are typically woody species, such as lantana (*Lantana camara*) and African olive (*Olea europaea* subsp. *cuspidata*). Under BAM 2020, manageable-HTW may be excluded from the gain calculations (paragraph 11.3.2(7.)). This allows a greater future vegetation integrity (VI) score to be achieved.

The list of manageable-HTW species was developed through literature review and expert elicitation with weed control specialists. Consultation included BAM accredited assessors (assessors), National Parks and Wildlife Service staff, Local Land Services weed coordinators, council staff, academics, and ecological consultants. The High Threat Weeds list is found on the BAM Calculator (BAM-C) landing page (see Section 8).

1.3 Scope of practice note

This guidance will support assessors and the Biodiversity Conservation Trust (BCT) to use the manageable-HTW setting on BSA sites. It details the:

- requirements for excluding manageable-HTW from the gain calculations
- influence of HTW cover on the gain calculations
- approach to calculating HTW cover in a vegetation zone
- approach to modifying HTW cover in the BAM-C, and
- required documentation to support use of the manageable-HTW setting.

This practice note does not replicate information provided in the BAM Operational Manuals (Stages 1 and 3) or BCT resources. It should be used in combination with those documents, which also provide guidance for broader integrated weed management and control on BSA sites (see Section 8).

2. Setting requirements

Excluding manageable-HTW cover from the gain calculations is an optional BAM setting. It recognises the additional benefits to biodiversity values when removal and control of manageable-HTW is undertaken with sufficient intensity. On a BSA site, all weed species must be addressed with an integrated weed management and control plan. The removal of manageable-HTW would be considered part of this plan.

Only those species categorised as 'manageable' in the High Threat Weeds list may be excluded from the gain calculations. This requires the target manageable-HTW to be removed and maintained at an ecologically insignificant cover, as agreed to with the BCT (e.g. <1%). For additional gain in VI to be achieved as predicted over 20 years, early removal of the target species is expected (e.g. initial five years of active management). The timeframe should be ecologically appropriate for the target species and site context.

Removal may be targeted at individual manageable-HTW species, rather than all present on the site. To achieve a meaningful VI gain, manageable-HTW species with the highest abundance should be targeted first.

The target manageable-HTW should be removed across the entire site. There may be circumstances, however, where this is not achievable. In these cases, justification for the approach must be included in the Biodiversity Stewardship Site Assessment Report (BSSAR). The assessor must demonstrate how continued presence of the target manageable-HTW will not impact its successful removal and control in select vegetation zones.

Greatest VI gains are likely to be achieved when removal of manageable-HTW is combined with other active restoration management actions (ARMA), such as supplementary planting. Depending on the site context, supplementary planting may be selective rather than extensive. If the cover of a non-manageable-HTW is expected to increase following removal of a manageable-HTW, pairing with supplementary planting should be considered. Off-target impacts (e.g. from spray drift) must also be considered in the prediction of future VI attribute values for native vegetation.

Increasing VI gain with active restoration (Section 3.2) will generally require additional ARMA beyond removal of manageable-HTW. In some cases, increasing future VI attribute values without implementing additional ARMA may be appropriate. Evidence to support the likelihood of natural regeneration achieving the predicted active restoration gains must be provided in the BSSAR. This will include detailed ecological justification, addressing characteristics of the subject land, vegetation zone and specific species that support natural regeneration; for example, referring to specific and significant impacts of a particular manageable-HTW species supressing regeneration of a native species or growth form group. An adaptive management approach must also be included in the management plan and contingency funding included in the total fund deposit (TFD) spreadsheet. Supplementary planting will be triggered should the ecological response targets for naturally regenerating attributes not be achieved.

An appropriate regime of ARMA to remove and control the target manageable-HTW must be developed, and costed in the TFD, by a qualified and experienced ecological restoration practitioner.

3. Influence of high threat weeds on gain

Under the BAM 2020 gain model, removal of manageable-HTW cover results in a greater VI gain. This is achieved by reducing the influence of total HTW cover on the intrinsic rate of increase for VI attributes and restoration risk weighting.

3.1 Intrinsic rate of increase

Total VI gain from required management actions is calculated using the intrinsic rate of increase for VI attributes. HTW cover limits the intrinsic rate of increase for most VI attributes (Table 1). In areas where HTW dominate, most VI attributes are expected to recover slowly, or not at all. When HTW cover is <10%, they are expected to have little impact. As their cover approaches ~50% however, their expected effect increases substantially (Figure 1).

Removing manageable-HTW from the total HTW cover estimate reduces its influence on the intrinsic rate of increase. This allows greater gain in VI attributes from required management actions over 20 years.

For more detail see BAM 2020, Appendix G.5 (Equation 11).

Table 1 **Vegetation integrity attributes and growth form groups with intrinsic rate of increase limited by high threat weed cover**

Structure		Composition		Function	
Tree	×	Tree	✓	Number of large trees	×
Shrub	✓	Shrub	✓	Litter cover	×
Grass & grass-like	✓	Grass & grass-like	✓	Length of logs	×
Forb	✓	Forb	✓	Regeneration	✓
Fern	✓	Fern	✓	Stem size class	×
Other	✓	Other	✓		

✓ = impacted by HTW cover, × = not impacted by HTW cover

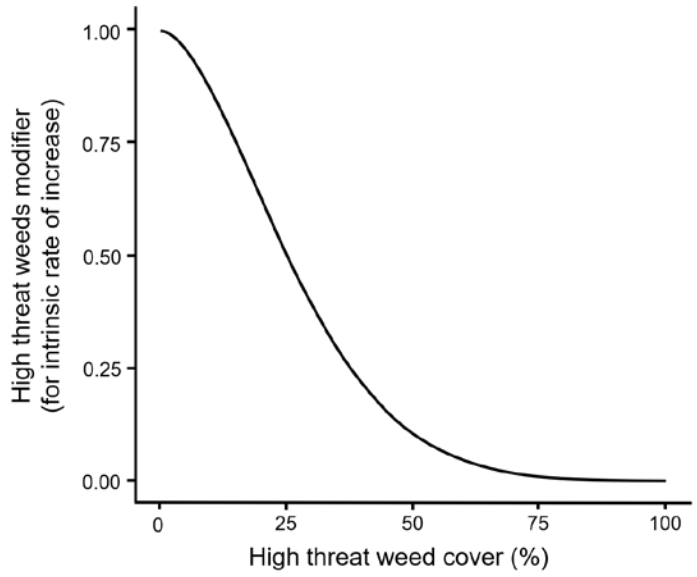

Figure 1 **Effect of high threat weed cover on the intrinsic rate of increase for vegetation integrity attributes (adapted from BAM 2020, Figure 4)**

3.2 Restoration risk weighting

Where ARMA are proposed, predicted future values of targeted VI attributes are limited by the restoration risk weighting. The restoration risk weighting is a pre-defined multiplier (0.3), modified by HTW cover. It restricts gain in VI attributes to account for the uncertainty in achieving predicted outcomes with active restoration.

Removing manageable-HTW from the total HTW cover estimate reduces the HTW modifier's effect on the restoration risk weighting (Figure 2). This allows greater gain in VI attributes from ARMA over 20 years.

For more detail see BAM 2020, Appendix H.9 (Equation 35) and Appendix G.7.6 (Equation 15).

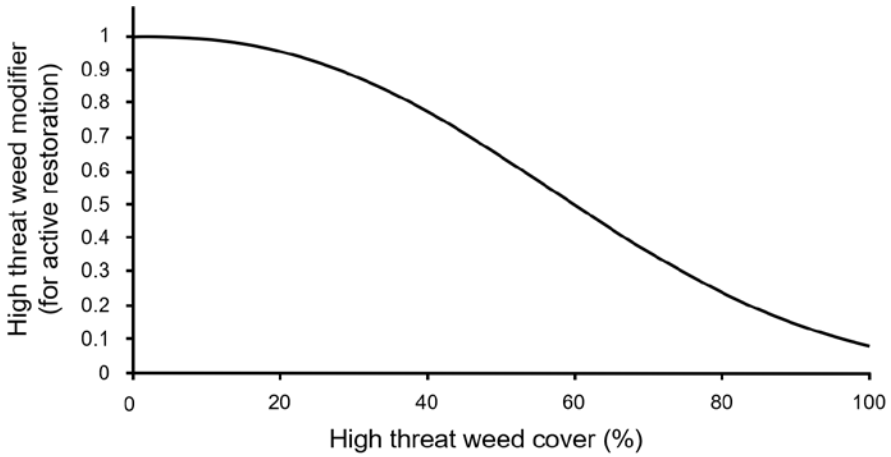

Figure 2 **Effect of high threat weed cover on the high threat weed modifier used to calculate the restoration risk weighting (adapted from BAM 2020, Figure 7)**

4. Calculating high threat weed cover for vegetation zones

When assessing vegetation condition, cover must be estimated for each HTW species present in a 400 square metre survey plot (BAM 2020, paragraph 4.3.4(21.)).

In each vegetation zone, the:

- HTW species cover = average of all plot values for a HTW species in a vegetation zone
- total HTW cover = sum of all HTW species cover values in a vegetation zone.

The cover of any manageable-HTW targeted for removal should be subtracted from the total HTW cover. This represents the future total HTW cover predicted for that vegetation zone.

The future total HTW cover value is entered into the BAM-C. It comprises the:

- unmodified total cover for all non-manageable-HTW species, and
- residual cover for any manageable-HTW not targeted for removal.

An example is provided in Table 2. The total HTW cover for this vegetation zone is 90%. African olive has a cover of 25%. Removal of this manageable-HTW will reduce the future total HTW cover to 65% – this value is entered into the BAM-C. Additional examples are provided below.

Table 2 Calculating high threat weed cover in a vegetation zone

Vegetation Zone 1							
Scientific name	**Common name**	**HTW category**	**Plot 1 (%)**	**Plot 2 (%)**	**Plot 3 (%)**	**HTW species cover (%)**	**HTW species future cover (%)**
Bidens pilosa	Cobbler's pegs	Non-manageable	5	0	10	5	5
Carthamus lanatus	Saffron thistle	Non-manageable	20	10	0	10	10
Olea europaea subsp. *cuspidata*	African olive	Manageable	10	5	60	25	0
Axonopus fissifolius	Narrow-leafed carpet grass	Non-manageable	55	50	45	50	50
				Total HTW cover		**90**	**65**

Non-manageable-HTW species cover must not be modified in the BAM-C. The BAM gain equations assume these species cannot be controlled on a site. In practice however, all HTW species require management under the integrated weed management and control plan (BAM 2020, Tables 6 and 7).

Example 1

Vegetation Zone A has a total HTW cover of 40%. The species comprising this cover are:

- *Lantana camara* (manageable), 20%
- *Ipomoea indica* (non-manageable), 20%.

The assessor proposes to remove and maintain *Lantana camara* cover at 0%. The future total HTW cover in Vegetation Zone A is 20% – this value is entered into the BAM-C.

Example 2

Vegetation Zone B has a total HTW cover of 20%. This is comprised completely of *Cortaderia selloana* (manageable), 20%.

The assessor proposes to remove and maintain *Cortaderia selloana* cover to 0%. The future total HTW cover in Vegetation Zone B is 0% – this value is entered into the BAM-C.

5. Modifying high threat weed cover in the BAM Calculator

Where removal of manageable-HTW is proposed, the total HTW cover may be modified in the BAM-C. Total HTW cover is automatically populated under 'High Threat Weed Cover' for each vegetation zone (Tab: Vegetation, section 'Future vegetation integrity (VI) with management').

To modify the total HTW cover (see screenshot in Figure 3):

- tick the 'High Threat Weed Cover' box, and
- enter the future total HTW cover (Section 4).

Only manageable-HTW species cover may be removed in the BAM-C.

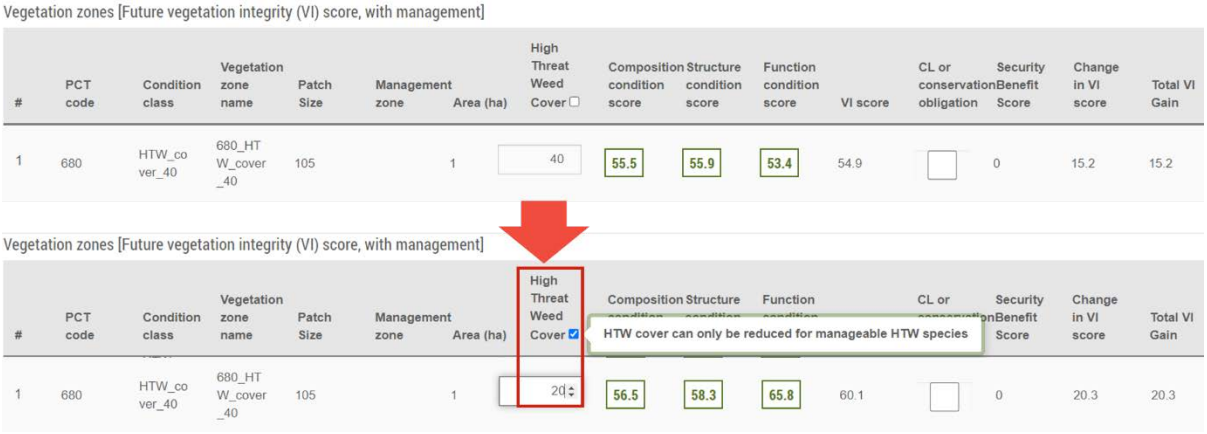

Figure 3 Modifying total high threat weed cover in the BAM-C

6. Additional required documentation

6.1 Biodiversity Stewardship Site Assessment Report

Where removal of manageable-HTW is proposed, supporting information must be documented in the BSSAR. This information is in addition to the standard BSSAR requirements, including details for all integrated weed management actions.

To address the removal of manageable-HTW, the assessor must include justification for the:

- proposed ARMA being necessary and appropriate to achieving predicted VI attribute targets
- predicted success of manageable-HTW removal and control where undertaken in only select vegetation zones
- off-target impacts from weed removal and control (i.e. weed spraying reducing native vegetation condition)
- likelihood of natural regeneration achieving the predicted targets (where supplementary planting is not proposed). Evidence should include reference to peer-reviewed scientific literature and the characteristics of the subject land, vegetation zone and specific species supporting natural regeneration.

The assessor must also include a table for each vegetation zone in which manageable-HTW will be removed (for example, see Table 2). Detail the:

- HTW species present (scientific and common name)
- HTW categorisation (manageable or non-manageable)
- HTW species cover values for each plot assessment (%)
- HTW species cover (i.e. averaged plot cover value) (%)
- HTW species future cover (%) – this is where any removal will be indicated
- total HTW cover (%)
- future total HTW cover (%).[1]

[1] For the purpose of the gain calculations in the BAM-C; in practice, BCT auditing against the management plan may require additional reduction in non-manageable-HTW species.

6.2 Management Plan

Where manageable-HTW cover is modified in the BAM-C, additional information must be documented in the BSA site Management Plan (Section 6: Integrated Weed Management Plan). For each vegetation zone in which manageable-HTW cover will be removed, include the following:

- Table: Weed species present
  - Vegetation zone/management zone
  - HTW species present (scientific and common name)
  - HTW categorisation (manageable or non-manageable)
  - HTW species cover (%)
- Table: Methods of weed control
  - manageable-HTW species (scientific and common name)
  - method of control
  - frequency and timing
- Table: Integrated weed management performance measures
  - manageable-HTW (scientific and common name)
  - performance measures (including interim targets).

Non-manageable-HTW cover cannot be reduced in the BAM gain equations (due to the model assumptions). In practice however, the management plan must provide actions and performance measures for all weed species. Weed species may be grouped (e.g. exotic grasses) or addressed individually.

Where manageable-HTW removal is proposed, the 20-year performance measure must be <1% (or another appropriate target, as agreed to with the BCT). Interim performance measures should demonstrate that the target species will be removed in the initial years of active management.

7. References

DPIE 2020, *Biodiversity Assessment Method*, NSW Department of Planning, Industry and Environment, Parramatta NSW.

8. Resources

Assessor resources
www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/accredited-assessors/assessor-resources

BCT BAM Accredited Assessor Resources
www.bct.nsw.gov.au/accredited-assessor-resources

BCT Total Fund Deposit Guideline
www.bct.nsw.gov.au/sites/default/files/2021-02/Final BSA TFD Guideline.pdf (PDF 582KB)

Biodiversity Assessment Method (BAM)
www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Biodiversity/biodiversity-assessment-method-170206.pdf (PDF 1.2MB)

Biodiversity Assessment Method Calculator (BAM-C)
www.lmbc.nsw.gov.au/bamcalc

BAM Operational Manual – Stage 1
https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-manual-2020-operational-manual-stage-1

BAM Operational Manual – Stage 3
https://www.environment.nsw.gov.au/research-and-publications/publications-search/biodiversity-assessment-method-operational-manual-stage-3

BioNet Atlas
https://www.environment.nsw.gov.au/wildlifeatlas/about.htm